IN THE UNITED STATES PATENT & TRADEMARK OFFICE

Application Number	:	09/843,166	Confirmation No. 8587
Applicant	:	Mitchell Corner et al.	
Filed	:	April 27, 2001	
Tech Cntr/AU	:	1764	
Examiner	:	Ellen M. McAvoy	
Entitled	:	Lubricant Compositions	
Attorney Reference	:	090128-0280189	
Customer Number	:	00909	

MAIL STOP ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

SUBMISSION OF PRIORITY DOCUMENT

Attached please find the certified copy of the following foreign application from which priority is claimed for this case:

Country	Application Number	Filing Date
Great Britain	9823455.2	October 28, 1998

Date: April 12, 2004

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The Patent Office
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I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

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Signed [redacted]

Dated 2 April 2004

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The Patent Office

1/77

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

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28 OCT 1998
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Cardiff Road
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Gwent NP9 1RH

2800196 190328-1 002677
P01/7700 0.00 - 9823455.2

1. Your reference

MTW 50684

2. Patent applicati *(The Patent Office will fu ...*

9823455.2

28 OCT 1998

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

IMPERIAL CHEMICAL INDUSTRIES PLC
Imperial Chemical House
Millbank
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SW1 3JF

Patents ADP number *(if you know it)*

9153003

If the applicant is a corporate body, give the country/state of its incorporation

UK

4. Title of the invention

LUBRICANTS

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

CHRISTOPHER ROBERT MILLROSS
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Patents ADP number *(if you know it)*

5547683004

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

YES

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Continuation sheets of this form	
Description	3
Claim(s)	0
Abstract	0
Drawing(s)	0

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature [signature] Date 26/10/1998

12. Name and daytime telephone number of person to contact in the United Kingdom

Christopher Robert Millross
01842 437843

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LUBRICANTS

This invention relates to lubricants, in particular to lubricants for air compressors based on a blend of a polyaklylene glycol and an ester.

Such blends, which have been described in US 4302343, EP 17072, US 4751012 and EP 227477 offer benefits over the conventional mineral oil type lubricants in terms of thermal and oxidative stability, reduced deposit formation, improved lubricity and increased service intervals.

Blends of lower alcohol initiated propoxylates or polypropylene glycol, combined with an aviation type neopentyl polyol ester or diacid ester which are available commercially perform well across a range of performance criteria such as low temperature fluidity and foaming tendency.

However, there are problems with these commercial products due to a tendency to form stable emulsions when mixed with water and it is an unfortunate fact that such mixing is unavoidable, unless air compressors are run in perfectly dry air conditions, due to the moisture in the air condensing out.

Emulsion formation can affect lubrication performance as well as the ability to measure the lubricant level.

Moreover, unlike conventional mineral oils, where the 'condensate' is easily separated from the oil and can be disposed of as water, 'condensate' containing emulsified lubricant is now considered as 'chemical' waste with all the associated costs of disposal.

The presence of water can also cause a reduction in the viscosity of the lubricant (affecting lubricant performance) and a change in the acid value which can increase the possibility of corrosion.

Clearly, the degree to which the lubricant takes up water is of great relevance.

A further problem can arise if such products are incorrectly added to a compressor containing mineral oil due to low miscibility with mineral oil.

It has been found that these problems can be overcome without detrimentally affecting other properties by blending specific polyalkylene glycols with specific esters.

According to one aspect of the invention there is provided a lubricant composition comprising a polyalkylene glycol having the formula

R O - $(CH_2CH(CH_3)O)_n$ - CH_3 where R=C1 to C15 alkyl, preferably C1-4, more preferably C1 and n=1 to 35, preferably 8 to 30,

and an ester.

According to a preferred aspect, the ester is a phthalate, a polyol ester, a diacid ester, or a trimellitate; the prefered phthalates are di-isodecyl phthalate, or 355 trimethyl hexyl phthalate.

Preferably, the composition contains an antifoam agent, an antioxidant and/or an anticorrosion agent.

The invention will be more readily understood from the following examples.

Example 1

Tests were carried out using a modified form of ASTM D1401 (a common industry test used as a measure of the demulsibility of lubricant/water mixtures) in which 40 parts by vol of lubricant and 40 parts by vol of water were mixed together to form an emulsion and left to stand.

The results, which together with comments are shown in the Table are based on x-y-z (t) where x is the volume of the oil layer, y is the volume of the water layer, z is the volume of the emulsion layer and t is the time taken to achieve the result; t = 5 is the minimum time for the test and so 40-40-0(5) is the ideal result.

Table 1

Demulsibility (ASTM D1401) - Esters/PAG Combinations							
Sample	Blend Ratio	Result	Oil	Water	Interface	Emulsion	Pass/
1	60:40	1-8-71(60)	cloudy	hazy	well defined	milky	Fail
2	60:40	0-5-75(30)	none	hazy	well defined	milky	Fail
3	53:47	40-40-0(5)	hazy	hazy	well defined	milky	Pas
4	70:30	0-38-42(30)	none	cloudy	well defined	milky	Fail
5	52:48	40-40-0(30)	hazy	clear	well defined	milky	Pas
6	52:48	40-40-0(30)	hazy	clear	well defined	milky	Pas
7	55:45	40-40-0(10)	hazy	clear	well defined	milky	Pas
All include 0.6% commercial antioxidant & anticorrosion package							

Sample 1 = a commercially available blend of butanol initiated propoxylate and pentaerythritol ester

Sample 2 = a commercially available blend of butanol initiated propoxylate and adipate ester

Sample 3 = a blend of methanol initiated methyl end capped propoxylate and a tetra ester of pentaerythritol and 2-ethyl hexanoic acid

Sample 4 = a blend of butanol initiated propoxylate and a tetra ester of pentarythritol and 2-ethyl hexanoic acid
Sample 5 = a blend of methanol initiated methyl end capped propoxylate and isodecyl phthalate
Sample 6 = as Sample 5 plus non- silicone antifoam agent
Sample 7 = a blend of methanol initiated methyl end capped propoxylate and 355 trimethyl hexyl phthalate

In respect of low temperature fluidity, measured as the pour point, i.e. the minimum temperature at which the lubricant could be poured, Samples 5, 6 and 7 (i.e those of the invention) were better (Pour Point -42°C) than the commercially available Sample 2 (Pour Point - 38°C).

Although Samples 5, 6 and 7 had a greater tendency to foam than Sample 1, such foaming could be controlled to achieve similar results by the addition of 50 ppm of, a commercially available, non-silicone antifoaming agent.

In respect of miscibility, Sample 1 was only miscible with oil at a 10% content whereas Sample 5 was miscible up to a content of 25%.

The effect of water on the viscosity and corrosivity was measured using the Beverage Bottle Test (based on a modified version of ASTM D2619) in which the changes in viscosity and acid value of a mixture of 75g sample and 25g water were measured after a period of 2 weeks.

The viscosity (cst at 40° C) was reduced by 3.1 in the case of Sample 1 whereas for Sample 6 the reduction was only 0.6. Similarly, the acid value mgKOH/g) changed to a greater extent for Sample 1 (0.54) than for Sample 6 (0.01).

To assess the water take up, samples were dried using a nitrogen purge until the water content measure 100ppm. Samples were then placed in dessicators at 75° C and the water content measured at intervals.

For both Samples 1 and 6, the water content rose steadily until reaching a constant level after circa 30 days. However, whereas the content of sample 1 was circa 6000 ppm, the content of sample 6 was only 4000 ppm.